TOSS-UP

1.   MATH; Short Answer:  The polar coordinates of a point are (3, pi/2)  (read: 3 comma pi over 2).  What are the cartesian coordinates of this point?

ANSWER:   0,3  OR X = 0, Y = 3

BONUS

1.   MATH; Short Answer:  The area bounded by the race track at your high school is a rectangle with semicircles at each end.  The radius of the circular parts is 30 yards and the perimeter of the area bounded by the track is 400 yards.  Within ten yards, how long is each straight section of the track?

ANSWER:  106 YARDS   (accept 96 to 116)

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TOSS-UP

2.  PHYS; Multiple Choice:  Weather satellites transmit cloud cover and temperature-humidity profiles back to Earth using images of which combination of the electromagnetic radiation types?

a)  infra-red and visible light
b)  ultraviolet and nuclear magnetic
c)  ultraviolet and infra-red
d)  ultraviolet and visible light

ANSWER:  A -- INFRA-RED AND VISIBLE LIGHT

BONUS

2.  PHYS; Short Answer:  The velocity of a ball tossed vertically into the air is expressed by the equation v(t) = -32t + 4 (read: v at time t equals minus 32t plus 4), where t is given in seconds.  Give the velocity of the ball when it reaches its highest point.

ANSWER:  0

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3.  BIOL; Multiple Choice:  The phase of contraction of a muscle occurs when:

    a)  tropomyosin (pron: trahp'-eh-my-oh-sin) binds and releases actin
    b)  myosin binds and releases actin
    c)  actin binds and releases myosin
    d)  none of the above


    ANSWER:  B -- MYOSIN BINDS AND RELEASES ACTIN

                    BONUS

3.  BIOL; Multiple Choice:  Select the INCORRECT statement concerning the
    muscular system.

    a)  Bones contact other bones at joints.
    b)  Flexors decrease the angle of a joint.
    c)  Adductors move a limb away from the midline.
    d)  Tendons attach muscle to bone.


    ANSWER:  C -- ADDUCTORS MOVE A LIMB AWAY FROM THE MIDLINE.

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                    TOSS-UP

4.  CHEM; Multiple Choice: Which of the following is a metallic salt of a fatty
    acid?

    a) soap
    b) plastic
    c) rubber
    d) petroleum


    ANSWER: A -- SOAP

                    BONUS

4.  CHEM; Short Answer: In a body-centered structure for cesium chloride how many
    nearest neighbor chloride ions surround a cesium ion?


    ANSWER:  8

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TOSS-UP

5.  COMP; Multiple Choice:  Who was the inventor of the tabulating machine which read data from punched cards and was used in the 1890 census?

    a)  Thomas Edison
    b)  Herman Hollerith
    c)  Blaise Pascal (pron: blez - pas - kal')
    d)  John von Neumann


    ANSWER:  B -- (HERMAN) HOLLERITH

BONUS

5.  COMP; Short Answer:  You are programming in FORTRAN.  What statement is used to invoke a subroutine?


    ANSWER:  CALL

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TOSS-UP

6.  BIOL; Multiple Choice:  Which type of muscle is a syncytium (pron: sin-sish-E-um)?

    a)  skeletal
    b)  cardiac
    c)  smooth
    d)  all of the above


    ANSWER:  B -- CARDIAC

BONUS

6.  BIOL; Multiple Choice:  What results when the potential difference across a membrane of a neuron equals the threshold?

    a)  movement of the membrane
    b)  action potential
    c)  relaxation
    d)  contraction


    ANSWER:  B -- ACTION POTENTIAL

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7. PHYS; Multiple Choice: An object is located 1 meter in front of a converging lens having a focal length of 20 centimeters. At what distance behind the lens (whose thickness is negligible) will the image be formed?

   a) 18 centimeters
   b) 20 centimeters
   c) 22 centimeters
   d) 25 centimeters

   ANSWER: D -- 25 CENTIMETERS

BONUS

7. PHYS; Short Answer: A 50 millimeter focal length camera lens photographs a 4 meter tall tree at a distance of 20 meters. How tall is the image of the tree?

   ANSWER: 10 MILLIMETERS

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TOSS-UP

8. CHEM; Multiple Choice: Which of the following scientists first stated the law of conservation of mass?

   a) Lavoisier (pron. La-voy-see-ay)
   b) Dalton
   c) Proust
   d) Boyle

   ANSWER: A -- LAVOISIER

BONUS

8. CHEM; Multiple Choice: Which of the following scientists hypothesized that it would be possible for particles to have wave-like properties?

   a) Planck
   b) Heisenberg
   c) Einstein
   d) de Broglie

   ANSWER: D -- DE BROGLIE

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9.  ASTR; Multiple Choice: How is the atmospheric pressure of Mars as compared
    to the atmospheric pressure of the earth?

    a) about the same as the earth's
    b) about 1/10th that of the earth's
    c) about 1/200th that of the earth's
    d) half as much as that of the earth's

    ANSWER:  C -- ABOUT 1/200th THAT OF THE EARTH'S

                BONUS

9.  ASTR; Multiple Choice:  Which of the following features of our moon is named
    Copernicus?

    a) sea
    b) crater
    c) mountain range
    d) rill

    ANSWER:  B-- CRATER

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                TOSS-UP

10. PHYS; Multiple Choice:  What reflecting surface forms a geometrically
    perfect image of a point source located at infinity (such as that
    approximated by a star)?

    a)  Paraboloid
    b)  Ellipsoid
    c)  spherical
    d)  Hyperboloid

    ANSWER:  A -- PARABOLOID

                BONUS

10. PHYS; Multiple Choice:  An automobile needs an antenna for its radio to
    play properly because:

    a)  the automobile's tires insulate it from the ground.
    b)  the automobile's body acts as a Faraday cage.
    c)  when the automobile moves, the velocity of the radio signal appears changed
        with respect to when it is at rest.
    d)  the transmitter also uses an antenna.

    ANSWER:  B -- THE AUTOMOBILE'S BODY ACTS AS A FARADAY CAGE.
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11. CHEM; Short Answer: How many hydrogen atoms are there in the organic compound 1,1,2,2-tetrabromoethane (read: tetra - bromo - ethane)?

ANSWER: 2

BONUS

11. CHEM; Short Answer: Give the molecular formula for the organic compound naphthalene.

ANSWER: $C_{10}H_8$ (READ: C-10-H-8)

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TOSS-UP

12. BIOL; Multiple Choice: Which structure does NOT play a part in the motion of cells?

a) microvilli
b) cilia
c) flagella
d) pseudopodia

ANSWER: A -- MICROVILLI

BONUS

12. BIOL; Multiple Choice: Bacteriophage (pron: back-teer'-e-o-faj) are:

a) bacteria
b) bacteria precursors
c) viruses
d) agents which cause the production of bacteria

ANSWER: C -- VIRUSES

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13.  ERSC; Multiple Choice:  Which of these pairs is always found in granites?

    a) muscovite and calcite
    b) quartz and orthoclase
    c) hornblende and talc
    d) augite and magnetite


    ANSWER:   B -- QUARTZ AND ORTHOCLASE

BONUS

13.  ERSC; Multiple Choice:  An example of a rock whose minerals have been crushed into thin sheets or bands is:

    a) shale
    b) schist (pron: shist)
    c) conglomerate
    d) granite


    ANSWER:   B -- SCHIST

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TOSS-UP

14.  CHEM; Multiple Choice: Which of the following four elements has the largest atomic radius?

    a) strontium
    b) francium
    c) calcium
    d) bromine


    ANSWER:  B -- FRANCIUM

BONUS

14.  CHEM; Multiple Choice: Which of the following odors does the ester, methyl salicylate (pron: suh'-lis-uh-ate), produce?

    a) cinnamon
    b) avocado
    c) orange
    d) oil of wintergreen


    ANSWER: D -- OIL OF WINTERGREEN

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15.  PHYS; Short Answer:  Name any THREE of the four elements that are ferromagnetic at room temperature (25 degrees Celsius).


ANSWER:   IRON; COBALT; NICKEL; GADOLINIUM

BONUS

15.  PHYS; Multiple Choice:  A block of metal that weighs 60 newtons in air and 40 newtons under water has a density, in kilograms per meter cubed, of:

a) 1000
b) 3000
c) 5000
d) 7000


ANSWER:  B -- 3000

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TOSS-UP

16.  BIOL; Multiple Choice:  Which of the following is NOT a mode of genetic exchange within a bacterial population?

a)  conjugation
b)  transduction
c)  transformation
d)  translation


ANSWER:  D -- TRANSLATION

BONUS

16.  BIOL; Multiple Choice:  The blastula develops into the:

a)  gastrula
b)  morula
c)  endoderm
d)  zygote


ANSWER:  A -- GASTRULA

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17.  CHEM; Short Answer: What is the EMPIRICAL formula for glucose?

   ANSWER: $CH_2O$  (read:  C - H - 2 - O)

BONUS

17.  CHEM; Multiple Choice:  Which one of the following is classified as a covalent network solid crystal?

   a)  CaO
   b)  $SiO_2$
   c)  $CO_2$
   d)  Pb

   ANSWER:B -- $SiO_2$

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TOSS-UP

18.  MATH; Short Answer:  The population of a near-by town was 10,000 in January, 1995.  It is estimated that the population will increase by 10% each year.  What will be the population of the town in January, 1997

   ANSWER:  12,100

BONUS

18.   MATH;  Short Answer:  If two sides of a quadrilateral are parallel and the other two sides are equal but NOT parallel, the quadrilateral is known as a:

   ANSWER:   TRAPEZOID

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TOSS-UP

19. ASTR; Short Answer: The English nickname for this CONSTELLATION is "The Chained Maiden". What do astronomers call this constellation?

ANSWER: ANDROMEDA

BONUS

19. ASTR; Short Answer: Hercules is a constellation that is commonly viewed in the summer in North America. In which of the seasons is the constellation "Pegasus" normally viewed?

ANSWER: AUTUMN

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TOSS-UP

20. BIOL; Multiple Choice: The nervous system develops from which germ layer?

a) ectoderm
b) mesoderm
c) endoderm
d) none of the above

ANSWER: A -- ECTODERM

BONUS

20. BIOL; Multiple Choice: The valve between the right ventricle and the pulmonary artery is the:

a) mitral valve
b) semilunar valve
c) bicuspid valve
d) tricuspid valve

ANSWER: A -- SEMILUNAR VALVE

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21. GENR; Short Answer: Which prefix is often used with scientific terms to indicate that something is the same, equal or constant?

ANSWER:  ISO

BONUS

21. GENR; Multiple Choice: The study of how people use tools to perform work and how people physically relate to their working environment is called:

a) engineering
b) ergonomics
c) agronomy
d) physiology

ANSWER:  B -- ERGONOMICS

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TOSS-UP

22. ERSC; Multiple Choice: The hydrolysis of orthoclase results in the formation of:

a) shale
b) kaolin
c) lime
d) hydrochloric acid

ANSWER:  B -- KAOLIN

BONUS

22. ERSC; Multiple Choice: The deposits of loess (pron. less) in the United States probably originated as which of the following?

a) talus
b) rock flour
c) humus
d) geyserite

ANSWER:  B -- ROCK FLOUR

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23. PHYS; Short Answer:  A machine performs 8 Joules of work in 2 seconds.  How
    much power is delivered by this machine?


    ANSWER:  4  WATTS

BONUS

23. PHYS; Short Answer:  A 10 kilogram body initially moving with a velocity of
    10 meters per second makes a head-on collision with a 15 kilogram body
    initially at rest.  The two objects stick together.  What is the velocity
    of the combined system just after the collision?


    ANSWER:  4 METERS PER SECOND

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TOSS-UP

24. COMP; Short Answer:  The following are a set of lines from a BASIC program.

    A = 25
    B = SGN(A)   (read:  B equals S G N - open parenthesis - A - close
    parenthesis)

    What is the value of B?


    ANSWER:  1  (SGN means sign, returns a +1 if A > 0)

BONUS

24. COMP; Multiple Choice:  In a FORTRAN program Y is set equal to -.127
    (read:  minus - point - 127).  What is the SMALLEST floating-point field
    specification that could be used to print the value of Y?

    a)  F4.3
    b)  F5.3
    c)  F6.3
    d)  F7.3


    ANSWER:  B -- F5.3

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TOSS-UP

25. GENR; Multiple Choice: A type of plastic that is biodegradable has been in the news lately. The ingredient that makes it biodegradable is:

a) vegetable oil
b) petroleum
c) cornstarch
d) leather

ANSWER: C -- CORNSTARCH

BONUS

25. GENR; Multiple Choice: Who was the marine biologist and author of Silent Spring who was one of the first people to warn of the dangers of pesticides like DDT?

a) Jacques Cousteau
b) Rachel Carson
c) Charles Darwin
d) Marlin Perkins

ANSWER: B -- RACHEL CARSON
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